REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

This Amendment is in response to the Office Action mailed on June 18, 2003. Claims 1-8 are pending in the application. Claims 1 and 4 stand rejected and Claims 2, 3, and 5-8 are objected to as being dependent upon a rejected base claim. The allowable subject matter in Claims 2, 3, and 5-8 is noted with appreciation. Applicants have amended Claims 1-8 and submitted new Claims 9 and 10.

Claims 1 and 4 are rejected under 35 U.S.C. § 102(b) as being anticipated by Price (U.S. Patent No. 1,946,234, hereinafter "Price"). In addition, Claims 1 and 4 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Price in view of Ogawa, Kioke et al. (U.S. Patent No. 4,843,837, hereinafter "Ogawa") and vice versa.

As related to allowable subject matter, Applicants respectfully submit that the subject matter recited in Claims 2, 3, and 5-8 have been rewritten in independent form, including all the limitations of the original base Claim 1, from which they all depended. Therefore, Applicants respectfully submit that the presently amended Claims 2, 3, and 5-8 are now allowable and an early notice thereof is requested.

As to the anticipation rejection of Claims 1 and 4, Applicants respectfully submit that the presently amended Claims 1 and 4 are not anticipated by Price because each and every element as set forth therein is not found, either expressly or inherently described, in the cited reference. The identical invention must be shown in as complete detail as is contained in the claims.

According to a feature of the instant invention, the number of heat exchanger tubes in a group of tubes at a downstream location of the cooling water flow passage is smaller than the number of tubes belonging to upstream groups. Accordingly, the total cross-sectional

area of the heat exchanger tubes in a downstream location is less than that of an upstream location of the flow passage. Because the flow volume of the cold water is essentially unchanged in the upstream/downstream locations, the flow velocity in the downstream side of the flow passage is higher than that in the upstream side, thus, even in the downstream location where the temperature differential is small, the heat flux is increased, resulting in an improved rate of heat transfer (see Specification, page 6, lines 14-33). Presently amended Claims 1 and 4 now more clearly recite these limitations.

Price relates to heat exchangers of the type comprising a shell containing metal tubes, the ends of which are welded to tube sheets located near the end of the shells. Price involves the use of tubes so constructed and arranged within the shell that the use of baffles can be eliminated and the pipes can be placed as close to each other as possible in the heat exchanger, while a good separation between them is maintained when welding the pipes to the tube sheets. In particular, in FIG. 8 of Price, a tubular shell 39 is disclosed having screw-threaded covers 40 and 41. This single pass heat exchanger also has a tube inlet 42 at one end of the shell and a tube outlet 43 at an opposite end thereof. The shell inlet is element 44 and the outlet is element 45. The tube sheets 46 and 47 are both welded, or otherwise permanently secured, to the shell 39. By swedging both of its ends, each tube 48 in the shell 39 has a reduced cross-section, thus making it possible to mount the tubes even closer together when welding them to the shell 39.

Those of ordinary skill in the art will note that, for a given pressure drop applied between the inlet 42 and outlet 43, Price's detrimental design will actually reduce the flow velocity through the tubes 48 at the locations having the larger diameter (i.e., most of the length of the pipes 48), thus reducing performance of the heat exchanger as a whole. In addition, for a desired flow velocity through the active region of the heat exchanger (i.e., the region where tubes 48 have the larger diameter), Price's invention will actually require a

larger pumping power compared to other heat exchangers because of the unnecessary flow losses associated with the expansion and contraction of each pipe as previously explained and also illustrated in FIG. 8 of Price.

Applicants respectfully submit that presently amended Claims 1 and 4 are not anticipated by Price. As to Claim 1, this prior art reference does not contain, among other recited elements, the limitation of "a total cross-sectional area of the heat exchanger tubes at a given location in a downstream section of the flow passage is smaller than a total cross-sectional area of the heat exchanger tubes in an upstream section of the flow passage at said given location" (presently amended Claim 1, emphasis added). Similarly, as to Claim 4, Price does not expressly or inherently contains the recited limitation of "heat exchanger tubes in a downstream section of the flow passage at a given location are spaced from each other by a first gap, and the heat exchanger tubes in an upstream section of the flow passage at said given location are spaced from each other by a second gap being larger than the first gap" (presently amended Claim 4, emphasis added). Consequently, Applicants respectfully request that the anticipation of Claims 1 and 4 under 35 U.S.C. § 102(b) be withdrawn.

As to the new Claims 9 and 10, Applicants respectfully submit that Price does not anticipate the subject matter recited therein because Price does not teach or disclose, expressly or inherently, among other recited subject matter, the limitations of either (1) a total cross-sectional area of the heat exchanger tubes at a given location is always smaller than a total cross-sectional area of the heat exchanger tubes in a location upstream of said given location of the flow passage (new Claim 9, emphasis added); and (2) the heat exchanger tubes in a given location of the flow passage are spaced from each other by a first gap, and the heat exchanger tubes in a location upstream of said given location of the flow passage are always spaced from each other by a second gap larger than the first gap. Rather, in Price, the total cross-sectional area of the pipes 48 first increases and then decreases, resulting first in a

decrease (as the pipe diameter decreases) and then a subsequent increase (as the pipe diameter increases) in the separation gap between the pipes. Such a design configuration leads to the poor performance noted hereinabove. Therefore, based at least on the foregoing reasons, Applicants respectfully submit that Price would not anticipate the invention recited in the new Claims 9 and 10.

As to the obviousness rejection of Claims 1 and 4 based on Price in view of Ogawa, or vice versa, Applicants respectfully submit that Price and Ogawa, either individually or in any combination thereof, cannot support a *prima facie* case of obviousness of the invention recited therein. This is so because even when combined, these prior art references do not teach or suggest all the claim limitations recited therein.

The outstanding Office Action acknowledged that Price does not specifically state that the heat exchanger can be used as an evaporator. Ogawa was cited simply as disclosing essentially the structure of Price being used as an evaporator. Applicants respectfully submit that Ogawa, being cited for the use of a heat exchanger disclosed by Price as an evaporator, does not remedy the above-noted deficiencies of Price as disclosing or teaching the above-listed limitations of the presently amended Claims 1 and 4 as well as the newly submitted Claims 9 and 10. Therefore, Applicants respectfully submit that Price and Ogawa, individually or in combination thereof, do not make obvious the invention recited in Claims 1, 4, 9, and 10. For this reason, Applicants respectfully request that the obviousness rejection of Claims 1 and 4 under 35 U.S.C. § 103(a) be withdrawn.

Based at least on the foregoing reasons, Applicants believe the present application is in condition for allowance, and respectfully solicit an early Notice of Allowability of Claims 1-10.

Respectfully submitted,

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